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CONTENTS

MSS. intended for publication and books, etc., intended for review should be sent to The Editor of Science, Garrison-on-Hudson, N. Y.

AGRICULTURAL GEOLOGY

DURING reconstruction, as the present period is frequently termed, many new applications of the principles of pure science to special fields of endeavor are being made. The principles of geology thus applied during recent years have given rise to economic geology, mining geology, engineering geology, oil geology and perhaps to that branch of the subject indicated by the above title for it is not entirely new. The application of the principles of the science to the solution of the geological problems that are met in agricultural enterprises and pursuits, in brief, the relation of geology to rural welfare may appropriately be considered as agricultural geology.

Such a problem is that of securing an abundant supply of pure water. In regions of copious rainfall it is essential, in those of average to minimum rainfall it is absolutely necessary to consider the properties and the structure of the substrata in their relation to water in order to obtain such a supply. Pursuant to the requirement of this necessity, the United States Geological Survey maintains a branch of service whose work is concerned with the water resources of the entire country. The purity of subsurface water depends chiefly on the filtering power of the yielding rocks. One of the best natural filters consists of residual material of considerable depth. Some rocks below this mantle are sufficiently pervious to hold, transmit, filter and consequently to yield pure water. Certain others are impervious. Another condition is found where the rocks contain joints or cracks along which water moves freely without filtration, conveying to wells or springs contamination from distant sources. This condition is a strong possibility in limestone regions. Artesian water which, in some localities, flows from wells may be found where the properties and structure of

the containing rock bears such a relation to a supply of water as will produce it. Under one combination of these conditions, as in areas of jointed igneous or metamorphic rocks in the Piedmont belt, an artesian well may yield a few hundred gallons daily; under another, that of a pervious sedimentary rock overlaid by impervious ones which outcrop in a moist region of higher elevation, as in the Great Plains, the yield may be several hundred gallons per minute.

Among the minerals most useful in agricultural pursuits are coal and other mineral fuels, the mineral oils (kerosene and gasoline), iron, salt, gypsum, lime, the minerals of the soil, and the fertilizer minerals yielding potash, phosphates and nitrates. The nature, quality, distribution and availability of most of these substances bear direct relations to their respective geological occurrences. In order that careful discriminations may be made in their purchase and use, those who have need for them should be familiar with their distinguishing properties and with their relative values.

In numerous localities natural gas is obtained from considerable depth. Gas provides fuel and light for use in buildings and power for machinery. Examples of such uses are common in agricultural districts in the gas-producing regions from Pennsylvania and West Virginia via Illinois southwestward to Texas and in other places, where many farmers depend almost wholly on the gas wells for these services. Gasoline for the auto and the tractor is now being extensively made from natural gas. At Anaconda, Montana, the tallest smokestack in the world, 585 feet, was erected to protect vegetation from destruction by smelter gases and soil from ruin by erosion due to this loss of its vegetative cover. Ducktown, Tennessee, and other mining districts afford additional illustrations of these principles. The gases and dust from the smelters, from the blast furnaces of the steel industry and from the flues of the cement mills, through skillfully devised systems of careful collection and concentration, are soon to yield a large proportion of the potash used as fertilizer.

In road building the adaptation of various materials even when only sand and clay are needed is determined by the properties of the minerals and rocks considered for this purpose and by the nature of the base on which the road is to be constructed. In locating a road along or near a slope or in any topographic position where strata outcrop, the drainage and therefore the safety and permanence of the road, or its failure, depend on the kinds of rock involved and on their structural relation. The rapidly growing use of motor vehicles emphasizes the importance of details in regard to road materials and road locations.

From the rocks at the surface or below it, suitable material is obtained for buildings and other structures necessary in agricultural enterprises. Such materials are used in making brick, cement and concrete, in building roads, bridges, dams and retaining walls and in the erection of dwellings and other buildings. A knowledge of the properties and adaptations of structural materials is essential to the intelligent selection of them and to their efficient use. It is also necessary in many localities to understand thoroughly the relations of the substrata to the surface in order to choose safe locations for permanent structures.

The way in which undrained areas were formed has much to do with the solution of the problems that arise when drainage is undertaken and with the kinds of soil reclaimed when the project is completed. Whether an area must be drained by means of surface ditches or whether an exit may be found through a pervious layer of rock below depends wholly on the elevation and on the nature and structure of the substrata. In arid and semi-arid regions the possibility of irrigation as well as the permanence of the aqueduct is dependent also on geologic and topographic factors. Of the sewage disposal plants which are needed on all farms most types can be located with safety in regard to water supply only by considering fully the conditions of geologic structure and materials in the vicinity.

The losses of soil by erosion due to the

action of wind or of water and in some localities due to the additional influence of improper tillage and pasturage bear definite relations to the topography of the area affected. Unfortunately the rich, black humas of the top soil, which is the best part of it, is the first to be removed—a fact that makes early prevention imperative. If the losses are permitted to continue a great succession of gullies and barren ravines soon develops and a worthless area is formed where valuable land could have been retained. The water table is perceptibly lowered over large areas by increased depth of drainage channels or removal of protective cover and this is another serious loss. On the other hand proper drainage may change an alkali soil to a fertile one. The chief processes that cause these losses involve the principle that the transporting power of water various as the sixth power of its velocity. This means that a current whose velocity is three miles per hour can carry more than eleven times as much sediment as one whose velocity is two miles per hour and that a current of three miles per hour loaded to its capacity will, on being reduced to two miles per hour or less, deposit more than 90 per cent. of its load. When a flood current subsides or is checked, an area of rich soil may be covered to a depth of several feet with sand or other worthless material. Prevention and partial restoration of losses may be accomplished as follows: Meandering channels may be replaced by large drainage ditches and with the aid of catchment basins in regions having high rate of rainfall, prevent flooding, and erosion of river bottom land. Other losses may be wholly or partly prevented by constructing retaining walls, by the use of tiling or of lined open drains, by contour tillage, by limited pasturage, or by planting trees, shrubs or grasses. Restoration may be partially made by constructing dams or by other means of ponding to check the current and arrest the moving sediment thereby changing the area from one of erosion to one of deposition.

Soil origin finds its explanation chiefly in the field of geology; soil distribution, largely in that of physiography. Different kinds of soils are produced from different kinds of rock or from the same kind of rock when subjected to different processes during the course of origin. For example, soils originating from a given kind of rock in a warm, wet climate will be very unlike those derived from the same kind of rock in a cool, arid region. A third kind of soil will result if the materials from the same kind of rock are transported and sorted by water before forming the final soil; a fourth kind, if transported by glaciation; and a fifth, if deposited by the wind. The various kinds of soil may differ from each other in number of mineral constituents or in the different proportions of each. The development of hills and valleys and other topographic forms by erosion gives rise to a different kind of soil in each topographic location. Kinds of soil arise also in numerous other ways each of which is a response either directly or indirectly to geologic or physiographic processes and conditions.

Classification of soils that they may be subjected to treatment conducive to the greatest production depends chiefly on the accurate use of the principles of soil origin and distribution. The changes recently made by the United States Bureau of Soils in the revision of classification units that were used in mapping a number of years ago afford excellent illustrations of this fact and of its recognition by the Soil Survey. The new divisions formed are based almost wholly on genetic and topographic relations—the principles of geology and physiography being applied to a much greater extent and in greater detail than in the earlier work.

The distribution of vegetation in so far as it is controlled by topography, kind of rock and geologic structure constitutes an important phase of agricultural geology. The distribution of soils, of rainfall, of temperature and of plant and animal life, the location of water courses, of valleys and uplands, of railways, highways and of markets as well as the adaptability of various areas to their respective agricultural uses are, to a remarkable extent, arranged in accordance with the topog-

raphy and with the kinds and relations of the underlying rocks.

The principles of improvement in domestic plants and animals are found in a diligent study of the geological history of their respective races and are fully illustrated in the development of the present forms of life from the ancient ones. These great changes in form, stature and intelligence make some of the useful stories in the earth's history as they are revealed by the record that is written in the rocks. By the study of this history man is encouraged in self improvement and in the realization of his responsibility to the world about him; he is inspired to higher ideals in his relations with his fellow man and in the field of intellectual achievement; he is stimulated to a more intelligent understanding of the powerful forces in nature and of their influence on the origin and on the destination of the human family.

In view of the present awakening to the needs of people in agricultural vocations and of the many relations of this science to rural welfare, it seems reasonable to expect that the study of agricultural geology in colleges and elsewhere will be extended until it is shared by all who are preparing to do work in rural improvement and that each will continue this study long enough to be able to apply the subject with intelligence.

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THE NOMENCLATURE OF FAMILIES AND SUBFAMILIES IN ZOOLOGY

Recent years have seen gratifying progress in the establishment of permanent rules of zoological nomenclature. Through the Stricklandian Code, the American Ornithologists' Union Code (commonly known as the A. O. U. Code), and, most recently, the International Code, greater uniformity of usage has been achieved than was ever before thought possible.

Family names, however, are still in very much the same state of nomenclatural chaos as were generic and specific names before the adoption of the Stricklandian Code in 1842. Zoological family and subfamily names have come and continued in use by a sort of *auctorum plurimorum* principle; and though current usage is more or less satisfactory so long as every one is agreed, any serious difference immediately causes trouble. Rules by which workers will agree to be bound, therefore, become necessary; and this, it were trite to say, is the reason for any code of nomenclature. Certain authors, however, have recently begun, for reasons other than zoological, to change many family names long in use, and it is, therefore, pertinent now to inquire into the desirability of such changes, and of the formulation of some principles for guidance. Since family and subfamily designations must depend on generic names, they are more in need of definite rules than are the names of still higher groups.

Latreille, in his "Précis des Caractères Générique des Insectes," published in 1796, was the real originator of the family concept in zoology, but he first designated these groups by number, though in a later work adopted plural Latin names with differing terminations. William Kirby, an English naturalist, in a paper on a new order of insects,[1] was the first to advocate the adoption of uniform patronymic endings in "*idæ*." The idea was soon afterwards adopted and elaborated by W. E. Leach, and subsequently by other authors, so that it was brought into general use during the succeeding decade. In 1825, N. E. Vigors, in a paper on the classification of birds, provided an entire set of family names with the ending *idæ*. It is of interest to note, in this connection, that German authors were far behind the English in adopting this improvement in terminology. Subfamily names in "*inæ*" did not come into general use until about the year 1830.

The first definite formulation of the principle of patronymic endings for family and subfamily names was in the Stricklandian

[1] *Trans. Linn. Soc. London*, XI., 1813, p. 88, footnote.

Code,[2] and is introduced in the following language:

B. It is recommended that the assemblages of genera termed *families* should be uniformly named by adding the termination *idæ* to the name of the earliest known, or most typically characterized genus in them; and that their subdivisions, termed *subfamilies*, should be similarly constructed, with the termination *inæ*.

The next epoch-making code of nomenclature, the A. O. U. Code of 1886, Canon V., adds to this only the proviso:

When a generic name becomes a synonym, a current family or subfamily name based on such generic name becomes untenable.

The revised A. O. U. Code of 1908 made no change in this.

The International Code of 1913 has only the following provisions regarding family and subfamily names:

Article 4. The name of a family is formed by adding the ending *idæ*, the name of a subfamily by adding *inæ*, to the root of the name of its type genus.

Article 5. The name of a family or subfamily is to be changed when the name of its type genus is changed.

The Entomological Code,[3] prepared chiefly by Messrs. Nathan Banks and A. N. Caudell, contains so many additional provisions regarding family and subfamily names that it seems worth while to quote entire the portions pertinent to the present discussion:

108. The name of a family shall be formed by changing the last syllable of the genitive case of an included generic name (preferably the oldest) into *idæ*.

109. The name of a subfamily shall be formed by using "*inæ*" in place of the *idæ*. One of the subfamily names shall be based on the same generic onym, or is removed from the family or subfamily, is a part.

113. The name of a family or subfamily is to be changed when the basic generic name is a homonym, or is removed from the family or subfamily, or becomes a synonym.

114. If there are two or more names proposed for the same family or subfamily ending in *idæ* or *inæ*, the earlier name shall be adopted.

15. If there are two family or subfamily names of the same spelling, the more recent shall be replaced, or so modified as not to conflict.

Recent multiplication of family and subfamily names in zoology and their dependence on generic designations make very desirable, in fact, almost necessary, definite rules for their selection and use. In any such rules, families and subfamilies should be treated alike (except, of course, for their difference in termination) just as are genera and subgenera.

The above-quoted codes of nomenclature fail to provide a perfectly satisfactory rule for the stabilization of family and subfamily names, as is fully realized by those who have had to deal with such designations. This is principally because these codes neglect particularly to define the term "type genus," *i. e.*, the genus on which the family name is based, and to specify the method of its selection. There are three methods that have heretofore been depended on for the determination of type genera and the consquent formation of family names; use of (1) the most characteristic genus; (2) the genus whose name is the oldest in the group; and (3) the genus which first formed the basis of a family name.

The first of these methods apparently was the consideration influencing most of the early writers, though there are indications that in many cases the genus for the family name was chosen at random. The objections to this first method are that it is not definite enough; that it depends on too many zoological conditions; and that it is open to continual alteration as the limits of the group change by the admission of other genera which might by some authors be considered more differentiated. In other words, this method of selecting the type genus is too much a matter of personal opinion in its zoological aspect to be of value as a nomenclatural rule.

[2] Report Brit. Association Adv. Sci. for 1842 (1843), pp. 105–121.

[3] "The Entomological Code, a Code of Nomenclature for use in Entomology," May, 1912.

The second method above mentioned, the use of the oldest name within any circumscribed family or subfamily group, is one that a number of modern zoologists use, although almost never with entire consistency, and it needs more careful consideration than the first. It possesses, it must be admitted, the advantage of definiteness and of easy application, but it likewise has several disadvantages which at once become evident when we attempt to apply it to all existing families alike, as we must do in pursuance of the main object of a nomenclatural rule. The most serious of these objections are as follows:

1. A family name would be changed when any genus with an older name than any of its original components is added to the group.

2. Any transference of a generic name to a genus of another family in which such generic name would be older than any already in that family would cause confusion in the transfer of the family name, a result that is always very undesirable.

3. The universal application of this rule would make wholesale changes in familiar family names in almost all branches of zoology, since until recently the use of the oldest genus was apparently only accidental, or because it happened to be the most prominent or characteristic group in the family. This is especially the case with the older authors; and the use of the oldest generic name is not by any means current practise among modern writers, even entomologists, since examination of Dr. Dalla Torre's "Catalogus Hymenoptorum" shows at once that a number of the subfamily and family names that he uses are evidently chosen by another method, for they are not based on the oldest genus included by him in their respective family or subfamily groups. Merely a *few* of the names that would have to be changed were this rule of the oldest generic name enforced are, in Hymenoptera: Ctenopelmatinæ, Dacnusinæ, Euphorinæ, Tetrastichinæ, Tetracampinæ, Tridyminæ; in mammalogy, Desmodontidæ, Oxyænidæ, Oxyclænidæ, Chinchillidæ, Dasyproctidæ, Erethizontidæ, Microtinæ; in ornithology, Ichthyornithidæ, Rallidæ, Gruidæ, Ciconiidæ, Œdicnemidæ, Cathartidæ, Phasianidæ, Picidæ, Capitonidæ, Pycnonotidæ, Ploceidæ and Frigillidæ.

4. Most important of all, it would prevent a definite and permanent concept of the type genus, since this would be constantly shifting by reason of the addition, subtraction, and changes of names.

The third method for the determination of the type genus is the use of the genus from the name of which a family designation was first formed, and the retention of this genus as the family type, whatever its name becomes. The chief objection to this is that it involves search through the literature for the earliest dates of family names, similar to that already made for generic terms. This, however, is not such a great task as might at first appear. In fact, Agassiz, in his "Nomenclator Zoologicus," has made a substantial beginning in this direction for all groups of zoology; while Dalla Torre has performed this service for Hymenoptera; Dr. T. S. Palmer, in his "Index Generum Mammalium," for mammals; and Mr. Robert Ridgway, in his "Birds of North and Middle America," for a part of the birds.

Its advantages do away with the chief drawbacks of the "oldest genus" rule. Most important, it provides a definite and permanent family concept in some generic group. Furthermore, it will prevent all changes in family names from the addition of genera or from alterations of generic names (other than of the type genus) within the family; it will obviate nearly all the transference of family names to unfamiliar associations, with the consequent confusion; and will cause comparatively few changes in the current designations of families.

To adopt any rule will necessarily involve some alterations in current family and subfamily names, but apparently far fewer changes result from what might be termed the "permanent type genus" rule than from that which selects the oldest generic name. The latter has the advantage of easier application and involves less research, but is not nearly so logical nor so scientific as the rule

which provides for a permanent type genus, since this rule corresponds almost exactly to the method of determining the type species of a genus.

A demonstration of the advantage of the "permanent type genus" rule is to be found in the case of the family Bubonidæ, to which the writer has elsewhere already called attention.[4] The generic name *Strix* Linnæus has been, by the mutations of nomenclature, transferred from the barn owls, family Strigidæ, to the horned owls, family Bubonida, and instated there as the proper name for the genus formerly known as *Syrnium*. It thus becomes the oldest generic name in the family Bubonidæ, and by the "oldest genus" rule would require the change of the name Bubonidæ to Strigidæ. By the third method above discussed, the genus *Bubo*, from which the family name Bubonidæ is formed, continues as the type genus, and no change in the name of the family Bubonidæ, into which the generic name *Strix* is introduced, is necessary. The family name Strigidæ would, in this case, disappear entirely, for the generic term *Strix*, removed from the former family Strigidæ, necessitates a change in this name Strigidæ to Tytonidæ, based on *Tyto*, the new name of its type genus formerly known as *Strix*. Thus, *the same generic group in each of these families would continue to remain the type genus, just as a species, whatever its name becomes, remains the type of a genus.* This method of a permanent type genus has been recently endorsed in print, at least inferentially, in the Entomological Code;[5] by Dalla Torre, as an examination of his "Catalogus Hymenoptorum" clearly shows; by Dr. C. W. Richmond in the case of the family Threskiornithidæ;[6] and definitely by Mr. E. P. Van Duzee[7] and Dr. Witmer Stone.[8] Furthermore, the following specialists in various groups, many of whom have personally furnished valuable suggestions, have given their approval to the principles and rules here presented:

Dr. T. S. Palmer; Dr. Witmer Stone; Mr. J. A. G. Rehn; Dr. C. W. Richmond; Dr. W. H. Dall; Dr. P. Bartsch; Dr. O. P. Hay; Mr. G. S. Miller; Mr. N. Hollister; Mr. J. W. Gidley; Mr. A. N. Caudell; Major E. A. Goldman; and Dr. W. H. Osgood.

Since some rule for the determination of the type genus is evidently necessary in order to stabilize family and subfamily names in zoology, the adoption of the third and last method above discussed, *i. e.*, that providing for a permanent concept of the type genus, is now advocated.

For the sake of completeness it seems worth while to formulate the following tentative nomenclatural rules for the determination and treatment of family and subfamily names. These embody all the above provisions in modern codes, with some additions, including that for the type genus just mentioned, and provide for the most important contingencies that may arise.

RULES FOR FAMILY AND SUBFAMILY NAMES

1. The name of a family is to be formed by adding the ending *idæ* to the stem of the tenable name of its type genus.

2. The name of a subfamily is to be formed by adding the ending *inæ* to the stem of the tenable name of its type genus.

3. Subfamily names shall for purposes of nomenclature be accorded the same treatment as family names.

4. The type genus of a family or subfamily must be one of its included genera.

5. The type genus of a family or subfamily is the included generic group from the name of which the family or subfamily name was originally formed, and is to remain the type genus irrespective of changes in its name.

6. A family or subfamily name formed from the name of an included genus is valid whether or not originally accompanied by a diagnosis, or by specific mention of the type genus.

[4] *Proc. U. S. Nat. Mus.*, LII., February 8, 1917, p. 190.

[5] Entomological Code, May, 1912, Rule 114, p. 22.

[6] *Proc. U. S. Nat. Mus.*, LIII., August 16, 1917, p. 636.

[7] *Ann. Entom. Soc. Amer.*, IX., 1916, pp. 89–91.

[8] *Auk*, XXXIV., No. 2, April, 1917, p. 228.

7. The law of priority, subject to that of generic names, shall be fully operative in relation to family and subfamily names.

Remarks.—This, of course, in cases where changes in family names become necessary, should not be held to apply to the use of any names that are not based on the type genus. (See remarks under Rule 12.)

8. In the application of the law of priority, consideration is to be given to all names employed respectively in a family or subfamily sense; and to all supergeneric group names not higher than the grade of family, if based on an included genus; but any such names when brought into use must have their endings changed to *idæ* or *inæ* if they were originally proposed with other terminations.

Remarks.—The necessity for some such rule is obvious, since many early authors, like Swainson, Vigors, and Bonaparte, used plural names with other terminations, such as *ina* and *ini,* which, of course, deserve consideration in determining the priority of family or subfamily names. Some authors, moreover, who extensively employed the terminations *idæ* and *inæ,* changed the penultimate syllable in the family name to "a" whenever necessary to conform to classical usage (*e. g.,* Sylviadæ, Laniadæ); and it is, of course, desirable to retain such names, but with the regular ending. Furthermore, this rule involves the treatment of all supergeneric group terms not higher than the grade of family as potential family or subfamily names.

9. When a family or subfamily is divided, its name is to be retained in both family and subfamily sense for that part containing the type genus of the original group. The remaining portion should take as its family or subfamily designation the earliest name based on any of its included genera. If there is no such name, the family or subfamily may take for its type genus any included genus, preferably the most characteristic or best known.

10. When a subfamily is raised to family rank, its type genus is to be retained as the type genus of such family group.

11. The family or subfamily formed by the combination of two or more families or subfamilies takes for its type genus the generic group in any of its components that was first made the basis of a family or subfamily name.

12. When for any reason the name of the type genus of a family is changed, the dependent family name must be changed to correspond to the new designation of the type genus.

Remarks.—Such change in the name of a type genus occurs whenever the generic term is found to be a homonym or synonym or is transferred to another family group. Since, of course, a family or subfamily designation must be based on the *tenable* name of its type genus, there is obvious necessity for a corresponding change of the family or subfamily name whenever any alteration takes place in the name of the type genus. In such case, to use a family name already proposed but based on another genus would thereby change the type genus of the family and violate Rule 5.

13. Of two family or subfamily names in zoology having exactly the same spelling, the later is to be distinguished from the earlier by the prefix "*Pro*": hypothetical example, Propicidæ.

Remarks.—Such preoccupation occurs when generic terms having the same word-stem are the bases of two or more family names; and to obviate the use of family names identical in spelling necessitates the selection of another designation in place of the family name invalidated. To replace the later name by one based on a newly selected type genus would be the logical method, were it not impossible in the case of monotypic family groups. Similarly, the use of a new family name formed by the addition of *idæ* to the nominative case instead of to the stem of the name of the type genus, would not avail should the nominative case happen to be the same as the stem.

The use of the prefix "*Pro,*" which we have selected on account of its meaning and its brevity, seems to be the most satisfactory rule that can be devised for such cases. For

segregate *Pica* Brisson, as the type and only genus of a separate family, the name of such family could not well be Picidæ, since this is already in use for another group, with *Picus* Linnæus as basis. Consequently the name of the family containing *Pica* would become *Propicidæ*.

HARRY C. OBERHOLSER
U. S. BIOLOGICAL SURVEY

FURTHER RESULTS OF ANALYSIS OF LIGHT DEFLECTIONS OBSERVED DURING SOLAR ECLIPSE OF MAY 29, 1919

1. SINCE the article in SCIENCE of June 11, 1919 (pages 581–585) was written, we have received through the kindness of the Astronomer Royal the printed "Report"[1] giving in detail the reductions and results of the light deflections observed by the two British expeditions during the solar eclipse of May 29, 1919. On the basis of the information in the "Report" we have made an independent reduction of the photographic measures resulting from Crommelin's plates.

The non-radial effects, as resulting from our calculations, are found to be on the average about one third of those derived from the British printed results and as given in the seventh column of Table II. of the previous article in SCIENCE (see page 583); in brief, *our non-radial effects are on the order of the error of observation, so that they may be regarded as non-existent until other observational evidence is obtained.*

2. Table I. contains the revised radial light deflections resulting from all reductions; they are subject to some slight changes when some required additional information has been received. Comparing the observed deflections with those computed on the basis of the Einstein theory of gravitation, it will be seen that generally the observed deflection is greater than the theoretical value.

TABLE I

Radial Light Deflections, May 29, 1919, at Sobral

No.	Star	Dist.[2]	Deflection		O-E
			Obs'd.	Einstein	
3	κ_2 Tauri	1.99	1".00	0".88	+0".12
2	Pi. IV. 82	2.04	1.00	0.85	+0.15
4	κ_1 Tauri	2.35	0.83	0.74	+0.09
5	Pi. IV. 61	3.27	0.57	0.53	+0.04
6	υ Tauri	4.34	0.55	0.40	+0.15
10	72 Tauri	5.19	0.35	0.34	+0.01
11	56 Tauri	5.38	0.31	0.32	−0.01

Star 11, the most distant star, according to the British reductions showed a deflection agreeing better with the value calculated on the basis of the Newtonian Mechanics, but it now shows a deflection agreeing better with the Einstein value. In brief, the results of all reductions would lend additional support to the conclusion reached by the British astronomers, namely, that, as judged by their best photographic plates, the light deflections observed during the solar eclipse of May 29, 1919, accorded better with the calculated values on the basis of the Einstein theory than on the basis of the Newtonian Mechanics.

3. Comparing the observed deflections with the theoretical ones, as given in Table I., it would seem that the former decrease with distance more rapidly than do the latter. Whether this implies that the observed light deflections were the combined effects of the sun's gravitational action and a solar atmospheric action of some kind can possibly not be settled definitely until further observational evidence has been obtained.[3]

LOUIS A. BAUER
DEPARTMENT OF TERRESTRIAL MAGNETISM,
WASHINGTON, D. C.,
July 17, 1920

[1] "A Determination of the Deflection of Light by the Sun's Gravitational Field from Observations made at the Total Eclipse of May 29, 1919," by Sir F. W. Dyson, F.R.S., astronomer royal; Professor A. S. Eddington, F.R.S., and Mr. C. Davidson, *Phil. Trans. R. S.*, London, Ser. A., Vol. 220, pp. 291–333. [The longitude of Sobral, as given on page 296, should read $2^h\ 41^m\ 25^s$ west, instead of $2^h\ 47^m\ 25^s$.]

[2] Expressed in units of the sun's radius.

[3] It may be suggestive that the light ray from star 2, which according to Table I. differed largely from the Einstein value, passed through the solar atmospheric region directly above the remarkable prominence on the southeast limb of the sun.

SCIENTIFIC EVENTS

CHEMICAL RESEARCH IN FRANCE AND ENGLAND

The Paris correspondent of the *Journal of Industrial and Engineering Chemistry* writes: "Scientific research is at this moment passing through a serious crisis. It is going to lack personnel. The alarm has been sounded by Professor Daniel Berthelot, the son of Marcellin Berthelot. In a recent speech he called attention to the utilitarian direction of all scientific research, and more especially chemical. We have here in France many schools of chemistry, but they are all schools of industrial chemistry. Almost without exception they are concerned with producing the industrial chemist, and, little by little, we are seeing the laboratories attached to professorships abandoned—laboratories such as that of Fremy at the Museum of Natural History, which have been the nurseries of the research chemists. The necessity which the younger generation feels of earning a living as soon as possible is the cause of this state of affairs. Add to this that most of the laboratories lack funds and can not bear the costs of theoretical research whose economic profit may be far distant. The public authorities, however, seem willing to consider these questions, and to-day, for instance, you may see in the French parliament, a deputy, Mr. Maurice Barres, offer one of the arguments which you Americans have so wisely brought to the solution of the social problem: 'It is useless to quarrel with wealth; it is better to use its activity to create more; and in this creation of wealth we chemists have a large duty to fill.'"

The London correspondent says: "In applied chemistry we are faced in Great Britain with a state of uncertainty and chaos without parallel in the recollection of any of us. No one can form any just estimate of the future supply or price of coal or other fuels; no one has any sure data upon which to base an opinion as to the future of the principal metals and other raw materials. Accounts from Germany and Austria are singularly conflicting and it is not easy for us to know whether in chemical industry we are to export to those countries at a reasonable profit or whether we shall suffer from acute competition from those countries. And in our own financial state nothing seems certain beyond the fact that grievous and necessary taxation will continue for a long period and will hamper the development of business and the starting of new enterprises. We have recently lived through times infinitely more anxious, and our neighbors in France and Italy have far more difficult problems to solve than we have. Our anxieties are as nothing to theirs and the state of political industrial and financial chaos in Germany, Austria and Russia is such as to be beyond conception. We are not merely perplexed by this; the aspect continually changes and it is hopeless for us to try and imagine what will happen in the east of Europe. In time some sort of settlement or stability will be achieved, but the details of the process are beyond the wit of man to imagine."

MEDICAL EDUCATION IN THE UNITED STATES

For the twentieth consecutive year the *Journal* of the American Medical Association publishes this week statistics dealing with medical education in the United States. In all medical schools during the last session there were 14,088 students, or 1,036 more than during the previous session. These increases are in the first, third and fourth year classes, smaller second year classes following the small freshman enrolment in the fall of 1918 caused by war conditions. The increased enrolments have been most marked in Class A medical schools, the number enrolled this year having increased from 87.9 to 89.6 per cent. of all students. The percentage in Class B schools decreased from 8.3 to 4.8, and in Class C schools it increased from 3.8 to 5.6.

The number of graduates this year was 3,047, or 391 more than in 1919. The number of graduates of Class A colleges was increased by 470, while the numbers graduating from Class B schools decreased by 116. Of the Class C colleges, there were 37 more graduates than in the previous year. The number of graduates holding degrees from colleges of

arts and sciences increased from 1,180 to 1,321, which is 43.5 per cent. of all graduates.

The number of medical colleges is eighty-five, the same number as last year. In 1904, when the Council on Medical Education was created, the United States had more medical schools than all other countries of the world combined. While the number of colleges has been reduced from 162 to 85 during the sixteen years, the number enforcing an entrance requirement of two years or more of collegiate work increased from four (2.5 per cent. of all colleges) in 1904, to seventy-eight (92.9 per cent.) in 1920. The number of medical students was decreased from 28,142 to 13,052—the lowest number—in 1919; but during the same period, the number who had higher preliminary qualifications was increased from 1,761 (6.2 per cent. of all students) in 1904, to 13,408 (95.2 per cent.) in 1920. The number of graduates was reduced from 5,747 to 2,656—the lowest number—in 1919; but the number having higher preliminary qualifications was increased from 369 (6.4 per cent. of all graduates) in 1904, to 2,842 (93.3 per cent.) in 1920.

WORK OF THE BUREAU OF MINES

DR. F. G. COTTRELL, director of the Bureau of Mines, announces the appointment by Acting Secretary of the Interior Hopkins, of F. B. Tough as supervisor, and R. E. Collom and H. W. Bell as deputy supervisors, to administer the operating regulations on oil and gas leases under the Department of the Interior. Mr. Tough will be stationed at Denver, Colorado, and will have personal charge of operations in the Rocky Mountain fields, as well as supervisory charge of operations on government lands in all fields. Mr. Collom will be stationed at San Francisco, California, and will have charge of operations in the California oil fields. Mr. Bell will be stationed at Dallas, Texas, and will supervise operations in the Louisana fields.

Mr. Tough is a graduate mining engineer. He has had seven years' experience in actual engineering and practical work for the Southern Pacific Company in the California oil fields and as petroleum technologist with the Bureau of Mines for four years. While with the Bureau of Mines, he covered practically all the oil fields in the United States, and has done much work in correcting water problems in Illinois, Colorado, Wyoming and California. He is the author of Bulletin 163, "Methods of Shutting off Water in Oil and Gas Wells." For the past year and a half he has been in charge of the conservation work in the Wyoming fields, under the cooperative agreement with the Rocky Mountain Petroleum Association, which has contributed $30,000 a year for the Bureau of Mines to demonstrate methods of drilling and operating wells in order to minimize the waste of oil and gas and damage to oil and gas sands. This work was so satisfactory that the Rocky Mountain Petroleum Association, consistng of the Midwest Refining Company, the Ohio Oil Company, and the Continental Oil Company, voluntarily suggested a renewal of the cooperative agreement for the second year and Mr. Tough will continue to supervise this cooperative work.

Mr. R. E. Collom is also a graduate mining engineer. He has had a number of years' experience in the mining camps, but has spent most of his time in the oil fields of California. He was deputy supervisor for the California State Mining Bureau, where he worked principally in the Santa Maria oil field, from which position he was transferred to San Francisco as assistant chief supervisor. Mr. Collom has been with the Bureau of Mines for one year, during which time he has been in many fields in the United States, and was in charge of the Dallas office of the Bureau of Mines for several months. He worked in the Texas and Louisiana oil fields, particularly in the Wichita Falls and Ranger Districts, where, with the assistance of W. A. Snyder and J. B. Kerr, a number of operating problems were solved and valuable recommendations made to the oil companies. Mr. Collem is the author of a manuscript to be published by the Bureau of Mines relating to development problems in the oil fields.

Mr. Bell is a graduate mining engineer

who spent a number of years in the mining camps, and then became interested in the oil business in Coalinga field, California, where he had much practical experience. For the past several years he has been with the California State Mining Bureau as deputy supervisor. He has recently been appointed as petroleum engineer with the Bureau of Mines, to take charge of the Dallas office, Texas. Government leases in Louisiana will be taken care of in conjunction with the demonstration work in Louisiana and Texas.

The supervisory work under Mr. F. B. Tough will cover the operating regulations to govern the production of oil and gas under the Act of February 25, 1920. These regulations cover only the active drilling, production, and gaging of oil and gas, the supervision of which has been assigned to the Bureau of Mines by the Honorable John Barton Payne, secretary of the interior. Other regulations relating to the giving of leases and permits, collection of royalty moneys, etc., are under the supervision of the General Land Office.

The operating regulations, before being submitted to the secretary of the interior, were submitted to representatives of the oil industry in the states concerned at a conference held in Washington under Assistant Secretary of the Interior Vogelsang, on April 1 and 2. These regulations, therefore, have the approval of representatives of the industry with practical field and business experience in oil and gas. The administration of the regulations will be undertaken by experienced engineers.

THE REORGANIZATION OF THE NELA RESEARCH LABORATORIES

The Nela Research Laboratory was organized in 1908 under the directorship of Dr. Edward P. Hyde as the physical laboratory of the National Electric Lamp Association. The name was changed to Nela Research Laboratory in 1913, when the National Electric Lamp Association became the National Lamp Works of General Electric Company. For some years the laboratory was devoted exclusively to the development of those sciences on which the art of lighting has its foundation, but in 1914 the functions of the laboratory were extended by the addition of a small section of applied science, which had an immediate practical objective.

The section of applied science is now being largely extended as a separate laboratory of applied science under the immediate direction of Mr. M. Luckiesh, who becomes director of applied science, and a new building is being constructed to house this branch of the work, which will be carried forward with a staff of several physicists, an engineer, an architect and a designer, together with the necessary technical and clerical assistants.

As has already been noted in Science, Dr. Ernest Fox Nichols, formerly president of Dartmouth College, and more recently professor of physics at Yale University, has accepted an invitation to assume the immediate direction of the laboratory of pure science, under the title of director of pure science. The work of this laboratory, which will be continued in the present building, will be somewhat further extended under the new organization.

The Laboratory of Pure Science and the Laboratory of Applied Science will together constitute the Nela Research Laboratories, and will be coordinated under the general direction of Dr. Hyde, who becomes director of research.

THE LISTER MEMORIAL

At a public meeting held at the Mansion House, London, in October, 1912, the following proposals for commemorating the work of Lord Lister were adopted: "The placing of a memorial in Washington Abbey, to take the form of a tablet with medallion and inscription; the erection of a monument in a public place in London; and the establishment of an International Lister Memorial Fund for the achievement of surgery, from which either grants in aid of researches bearing on surgery or awards in recognition of distinguished contributions to surgical science should be made, irrespective of nationality." *Nature* reports that a meeting of the general committee was held in the rooms of the Royal Society on

Monday, July 19, to receive and adopt the report of the executive committee appointed in 1912. The chairman, Sir Archibald Geikie, stated that the sums received in respect of subscriptions from the British Empire and foreign countries amounted to £11,846 5s. 10d. A memorial tablet, executed by Sir Thomas Brock, was unveiled in Westminster Abbey on November 1, 1915, and steps are being taken for the erection of a monument in a public place in London. In order to carry out the scheme for the establishment of the International Lister Memorial Fund for the Advancement of Surgery, it was resolved that: (*a*) Out of the general fund a sum of £500, together with a bronze medal, be awarded every three years, irrespective of nationality, in recognition of distinguished contributions to surgical science, the recipient being required to give an address in London under the auspices of the Royal College of Surgeons of England. (*b*) The award be made by a committee constituted of members nominated by the Royal Society, Royal College of Surgeons of England, Royal College of Surgeons in Ireland, University of Edinburgh, and University of Glasgow. (*c*) Any surplus income of the general fund, after providing for the erection of a monument and defraying administrative expenses, be either devoted to the furtherance of surgical science by means of grants or invested to increase the capital of the fund. The Royal College of Surgeons of England has consented to become the trustees and administrators of the Lister Fund and to carry out its objects, subject to the above provisions of the scheme. The subscription list is still open, and the honorable treasurer of the fund is Sir Watson Cheyne, Bart., to whom donations may be addressed at the Royal Society, Burlington House, London, W. 1.

SCIENTIFIC NOTES AND NEWS

CAMBRIDGE UNIVERSITY has conferred the degree of doctor of laws on Dr. John J. Abel, professor of pharmacology at the Johns Hopkins Medical School, and on Dr. Harvey Cushing, professor of surgery in Harvard University.

DR. WILLIAM W. KEEN, professor emeritus of surgery at the Jefferson Medical College, president of the International Surgical Society, recently in conference at Paris, presided at the opening sessions.

PROFESSOR M. T. BOGERT, of Columbia University, recently nominated a tariff commissioner by President Wilson, has declined the appointment.

DR. JOHN G. ADAMI, vice-chancellor of the University of Liverpool, formerly professor of pathology and bacteriology in McGill University, has been elected to an honorary fellowship in Christ's College, Cambridge.

THE *Journal* of the American Medical Association reports that having reached the age limit, Dr. Amalio Gimeno y Cabañas, professor of pathology at the University of Madrid, senator and at one time minister in the cabinet, was given an ovation in the university amphitheater at a special gathering for the purpose. He was presented with a medallion and a banquet followed.

PROFESSOR ALBERT S. FLINT, of the department of astronomy of the University of Wisconsin, retires from active work this month after thirty-one years of service on the university faculty. He will continue his association with the department as emeritus professor of astronomy.

DR. MARCUS BENJAMIN, editor of the publications of the United States National Museum in Washington, has received from the French minister of public education the award of the Palms, with the rank of "Officier de l'instruction publique."

THE Canadian Council of Scientific and Industrial Research has awarded $5,000 to Professor J. C. McLennan, of the University of Toronto, for his research into the properties of helium.

THE Prussian Academy of Science has granted Dr. Agnes Bluhm 1,000 Marks to continue her experimental work on problems of heredity.

DR. SAMUEL W. HAMILTON, of the Utica State Hospital, has been appointed chief medical di-

rector of the Hospital for Mental Diseases, Philadelphia.

Charles S. Howard, formerly an instructor in the department of electrical engineering and physics at the U. S. Naval Academy, has accepted a position as junior chemist in the Quality of Water Division of the Water Resources Branch of the U. S. Geological Survey, Washington, D. C.

Mr. W. D. Collins has left the Bureau of Chemistry of the Department of Agriculture to take charge of work on quality of water for the U. S. Geological Survey.

Dr. Charles L. Parsons, secretary of the American Chemical Society, has returned to Washington following the adjournment of the International Union of Pure and Applied Chemistry at Rome, where he acted as the American representative.

W. S. W. Kew, of the U. S. Geological Survey, is studying the oil conditions of northwestern Mexico for private parties while on furlough from the government service.

R. B. Moore, chief chemist of the Bureau of Mines, and Dorsey Lyon, supervisor of mining experiment stations, are going south to inspect sites suggested for a mining experiment station to deal with problems of non-metallic mining, as provided for at the last session of Congress.

The *Journal of Industrial and Engineering Chemistry* records changes in positions as follows: A. J. Lewis has resigned from the Bureau of Standards, where he was engaged in paint and varnish analysis as assistant chemist, and is at present with the H. H. Franklin Manufacturing Co., Syracuse, N. Y., as research chemist in paints, varnishes and enamels. Dr. Fred C. Blanck has resigned as food and drug commissioner of Maryland and associate in chemistry in the Johns Hopkins University to accept a position as director of inspection in the Del-Mar-Via Inspection District of the National Canners Association, with headquarters at Easton, Md. Dr. R. L. Sebastian, formerly engaged in magnesite investigation with the U. S. Bureau of Mines, Berkeley Station, Calif., has accepted a position as research chemist with the Barrett Co., Frankford, Pa. Mr. Arthur C. Metcalf has resigned as junior chemist, Bureau of Chemistry, U. S. Department of Agriculture, to become chemist for the Republic Packing Corp., Lockport, N. Y. Mr. Ferdinand A. Collatz has resigned his assistantship in the department of biochemistry, University of Minnesota, to accept a research fellowship with the American Institute of Baking, Minneapolis, Minn.

We learn from *Nature* that the civil list pensions granted during the year ended March 31 include: Mrs. Howell, in recognition of her late husband's eminent public service in the Geological Survey of Great Britain, £50; Miss Juliet Hepworth, in recognition of her late brother's services to meteorology and oceanography, £50, and Mrs. K. Macdonald Goring, in recognition of her husband's services to biometrical science, £85.

"Trends in Psychology" was the subject of an address delivered on July 22 at Stanford University by Professor W. V. Bingham, of the Carnegie Institute of Technology.

At the request of the Röntgen Society, Dr. W. D. Coolidge, of the research laboratories of the General Electric Company, gave an address on July 15 at University College, London.

Dr. Richard A. Berry, professor of anatomy in the University of Melbourne, has been appointed Stewart lecturer for 1921 in that university. Professor Berry has recently, in conjunction with Mr. S. D. Porteus, director of the research laboratory of the training school at Vineland, New Jersey, issued a report describing a practical method for the diagnosis of mental deficiency and other forms of social inefficiency, and will devote his Stewart course to this subject.

Dr. J. Bucquoy, president of the Paris Academy of Medicine, has died at the age of ninety-one years. He had attended the meetings of the academy to the day before his death, which was due to a street accident.

The death is announced of Dr. T. Debaisieux, one of the most eminent surgeons of Belgium, and emeritus professor of sur-

gery at the University of Louvain. Before his death, Dr. Debaisieux had the gratification of seeing his son appointed to the chair which he himself had held for many years.

THE American Public Health Association will meet in San Francisco, September 13-17. The program will include the Relative Functions of Official and Non-Official Health Organizatons; Western Health Problems; Narcotic Control; Food Poisoning; Organization for Child Hygiene; Mental Hygiene; Health Centers. These subjects and others will be distributed among the following ten sectional groups: General Sessions; Public Health Administration; Laboratory; Vital Statistics; Sociological; Sanitary Engineering; Industrial Hygiene; Food and Drugs; Personal Hygiene; Child Hygiene.

THE *Journal* of the American Medical Association states that Dr. F. F. Simpson, of Pittsburgh, recently spent several months in Europe with a view to interesting the medical profession of the world in the project of reorganizing on a uniform basis all international societies related to the various branches of medicine. It is proposed to create a federation of these societies and to establish an international medical press bureau which shall be charged with making known all important discoveries to the medical press of the world, thus assuring rapid diffusion of medical knowledge. A committee of ten, composed of two physicians from each of five countries, Belgium, France, Great Britain, Italy and the United States, has been named and will meet soon in Paris or London to set the new organization on foot.

WE learn from *Nature* that a congress of Philosophy to which members of the Société Française de Philosophie and the American Philosophical Association are sending delegates, is to take place at Oxford on September 24–27. Two of the subjects of discussion are likely to be of especial scientific interest: one a symposium on the principle of relativity, to be opened by Professor Eddington, and the other a discussion to be opened by Dr. Head on disorders of symbolic thinking due to local lesions of the brain. The opening meeting of the congress will be presided over by Professor Bergson. Arrangements are under the direction of Mr. A. H. Smith, New College, Oxford.

UNIVERSITY AND EDUCATIONAL NEWS

GIFTS of $150,000 each to Bowdoin and University of Maine, $70,000 to Coes Northwood Academy at Durham, N. H., and $10,000 to the Eastern Maine General Hospital are included in the will of Dr. Thomas Opham Coe.

SIR JESSE BOOT has given £50,000 to the new Nottingham University scheme—£30,000 for building and £20,000 for a chair of chemistry. A gift of £15,000 has been made to Liverpool University by Alderman Louis Samuel Cohen. A further gift of £6,000 has been received by the University of Cambridge from Mr. and Mrs. P. A. Molteno to meet the increased cost of labor and material in the building of the Molteno Institute of Parasitology.

DR. CHARLES HUBBARD JUDD, head of the department of education of the University of Chicago and director of the school of education, has been made chairman of the department of psychology to succeed Professor James R. Angell, who resigned to accept the presidency of the Carnegie Corporation of New York.

PROFESSOR ARTHUR M. PARDEE has resigned from the chair of chemistry at Washington and Jefferson College, Washington, Pa., to become the head of the department and professor of chemistry at the University of South Dakota, Vermillion, S. D.

AT the University of Arizona, Mr. J. G. Brown has been promoted from an assistant professorship in biology in the college of arts and science to the position of professor of plant pathology in the college of agriculture and plant pathologist of the Agricultural Experiment Station.

DR. DWIGHT E. MINNICH, instructor in physiology and zoology at Syracuse University, has become instructor in animal biology at the University of Minnesota.

The British Medical Journal reports that professors of the Paris Faculty of Medicine have been placed in two classes according to their seniority, those in the first class receiving a salary of 25,000 francs and those in the second class a salary of 23,000 francs. By a recent ministerial decree Professors Richet, Pouchet, Hutinel, De Lapersonne, Gilbert, Roger, Nicolas, Ribemont-Dessaignes, Quénu, Prénant, Widal, Chauffard, and Weiss have been put in the first class, and Professors Delbet, Marfan, Hartmann, Bar, Marie, Broca, Teissier, Desgrès, Lejars Achard, Robin, Legueu, Letulle, Couvelaire, Carnot, Besançon, Vaquez, Dupré and Jeanselme in the second class.

DISCUSSION AND CORRESPONDENCE

TRANSVERSE VIBRATIONS OF RODS

To the Editor of Science: In reference to Professor Cady's paper on "The Theory of Longitudinal Vibrations in Rods having Internal Losses" in the *Physical Review* for February, I should like to say that we have made in the laboratory of Clark University during the last ten years a very great many measurements of transverse vibrations of rods of all sorts of materials and that we find that the theory of viscosity is by no means substantiated. Until Professor Cady's experimental results are published I shall therefore have to reserve my opinion as to the application of this theory to longitudinal vibrations.

I would say in justice to myself and my students that our results have been held back so long because we have attempted to apply the theory of elastic hysteresis to the subject and the difficulties in the solution of the Volterra integro-differential equations involved have been so great that we have not been able to finish the theoretical results. It looks at present as if that theory was not substantiated either. Accordingly, it will be necessary to invent a new theory or a combination of both. I have now decided to publish the experimental results without waiting for the theory and they may be expected to appear soon in the *Proceedings* of the National Academy of Sciences. The subject is an extremely interesting one and of great importance for many reasons.

Arthur Gordon Webster
Clark University, July 13, 1920

THE EXPLORATION OF VENEZUELA

To the Editor of Science: With three companions, I have just returned from a collecting trip in western Venezuela, and I found there some conditions which will probably be of interest to others who may contemplate a scientific trip in the tropics.

At the present time in western Venezuela there is considerable activity in oil development, not only in exploration, but in the establishment of permanent camps and refineries. Two of these camps are located in country entirely different in character. Arrangements could be made by any one desiring to visit these camps to make them his headquarters, thus rendering accessible for study faunas and floras which the student could otherwise reach and study only at considerable trouble and expense.

One of these camps is about twenty miles from Maracaibo in a desert region. The flora and birds here would be of especial interest.

The other camp is located on the Rio Oro, a tributary of the Catatumbo, and is reached by launch from Encontrados, a town about ninety miles from the mouth of the Catatumbo, which town can be reached by steamer without change of boat from Maracaibo. This camp is in a well watered and heavily forested region, as I was told, but I did not have an opportunity to visit the camp myself.

The camp near Maracaibo belongs to the Caribbean Petroleum Company, with offices at Maracaibo. The other camp belongs to the Columbian Petroleum Company, and letters of inquiry relative thereto might be addressed to Mr. David Brullenbourg, Encontrados.

I was informed by several gentlemen connected with both petroleum companies that any one interested in the fauna and flora of the region would be welcome at these camps, and his expenses there would be reduced to the minimum. These camps offord an oppor-

tunity of living in health and safety in regions where such considerations are of vital importance. Maracaibo can be reached from New York City by the Red "D" Line in from ten to twelve days, and once at Maracaibo, the camps can be reached without difficulty.

In addition to these permanent camps, there is more or less exploration going on, and I was informed by two gentlemen that scientific investigators would be welcome with such exploring parties. Correspondence relative to this matter might be addressed to Mr. Grady Kirby and Mr. J. Whitney Lewis, care of The American Consul, Maracaibo. The Lake Maracaibo region offers an available field to collectors, and there are well-established and regular lake steamer lines, and from Encontrados, to mention only one of the railroads, a railroad extends to Estacion Tachira at the foot of the mountains at an elevation of 364 meters. Between the terminals of this railroad are two or more other points in desirable country for study and collecting. From Estacion Tachira there is an automobile road to San Cristobal, which is on one of the head waters of the Orinoco river.

E. B. WILLIAMSON

MATHEMATISCHE ZEITSCHRIFT

IN view of the numerous reports of the present hardships of German scientists it may be of interest to note that in 1918 a new journal devoted to mathematical research was started in Germany under the title *Mathematische Zeitschrift*, and that three volumes of this periodical appeared in 1919 while only two volumes were expected to be published annually according to the announcement.

This evidence of activity in mathematical research seems to reflect an optimism which one might not have expected under present conditions. The subscription price of the first four volumes of this journal was 24 marks per volume, for the fifth volume it was raised to 32 marks, and for the sixth it was again raised to 48 marks. The director of the journal is L. Lichtenstein, of Berlin.

G. A. MILLER

SCIENTIFIC BOOKS

Aids to Forecasting. By E. GOLD, F.R.S. Published by the Air Ministry. London, 1920.

This publication officially numbered Geophysical Memoir No. 16, gives a classification of the Daily Weather charts, 1905 to 1918. The weakness of any such classification is, of course, the assumption that like surface isobaric conformations are always followed by similar weather conditions.

The general principle which Colonel Gold uses in selecting 15 types and subtypes, recognizes the position of the anticyclone as the dominating feature. This we are glad to notice because for many years forecasters have centered their attention on the "low"; naturally enough, overlooking the fact that directive force and course of the "lows" are determined largely by the antecedent or adjacent "highs." Doubtless we shall have better forecasts for the North Atlantic seaboard when there is a fuller knowledge of the relation between advancing "lows" and those quick moving anticyclonic areas from the north known as "Labrador highs."

This series of British charts starts with the anticyclonic to the S.W. then moving east until over Western Europe, then S.E., E., N.E., N., N.W., and W.

Additional charts of special character are included, such as the indefinite area of low or high pressure, the trough, the dumb-bell depression and the depression centrally situated. The types were selected primarily with reference to the weather of southeastern England and northeastern France.

The forecaster fits his chart to the classified type and finds in a table corresponding type dates. Referring to the charts for those days he studies the general results. It is suggested that a local forecaster ought to have a set of synoptic charts interleaved so that he may study the weather in more detail.

The primary purpose of the arrangement is to assist in day-to-day forecasting; but the data can be employed in discussing from

a statistical standpoint the weather associated with different types.

Colonel Gold mentions the work of Captain Brunt during the war, showing the relation between the amount of low clouds in Flanders at different hours and the general direction of the wind. It appears that with the westerly type there was decreasing cloudiness.

The scheme of indexing, tagging and classifying pressure charts is of course, not new. Odenbach, Brandenburg and others have made classifications for limited areas in the United States, and Bowie and Weightman for the whole country, giving with much detail the storm paths.

Some of the notes made on the different types are extremely interesting: Thus, type I. is very favorable for west winds at night; and a notable instance occurred during the battle of Cambrai, November 20, 1917; the transitional type of fair weather in the evening and inland fog in the morning, occurred on March 20, 1918, when the Germans began their great offensive. Evidently the German forecasters picked the hour. And again May 27 to 31, 1918. Type III. is one that worries the forecaster, for squalls come when he expects fair weather. He forecasts rain in front of the trough and gets fair weather in front and rain behind. On August 26, 1916, seven British airplanes failed to return because of a squall coming from the west while the planes were over the German lines. A different type occurred in June, 1917, during the battle of Messines, for which a week's fair weather was accurately forecast. Type IX. means unpleasant weather. "The most noticeable example in history of this type," says Gold, "is the one which persisted for the first three days of August, 1917, during the battle of Ypres." Type VI. is the typical fair weather anticyclonic type. This type prevailed at the time of the German offensive in March, 1918, and also immediately after the armistice.

It is evident that the forecaster from now on takes his place in all military councils for both offensive and defensive operations.

A. M.

SPECIAL ARTICLES

LINKED GENES IN RABBITS

The so-called "English" rabbit possesses a dominant pattern of white spotting. A homozygous English mated with non-English rabbits produces heterozygous English young exclusively. These mated with non-English rabbits produce equal numbers of English and non-English young. Facts such as these show conclusively that the English pattern is dependent upon the inheritance of a single Mendelian gene. I have recently discovered that the gene in question is linked with another gene, that for intense *vs.* dilute pigmentation. Dilution is a recessive character alternative with intense pigmentation. Intense pigmentation is seen in rabbits of the varieties, gray, black and yellow. Dilute pigmentation is seen in blue-gray, blue, and dilute yellow rabbits.

Summary of	(1) Eng. Int.	(2) Non-Eng. Dil.	(3) Eng. Dil.	(4) Non-Eng. Int.
Oct., 1919.....	5	6	4	4
Feb., 1920.....	6	9	6	4
June 1920.....	9	10	5	5
July, 1920.....	3	3	1	3
Total.....	23	28	16	16
	Non-crossovers		Crossovers	

In a certain experiment, I crossed a black English rabbit with a blue non-English rabbit. A male from this mating was black English in appearance, but from his parentage was known to be heterozygous both for English and for intensity. He was subsequently mated with blue non-English females, which of course would be homozygous for the recessive member of each of the two character pairs. If no linkage occurred between the two pairs of characters, young would be expected of four classes all equally numerous, viz., (1) English intense, (2) Non-English dilute, (3) English dilute, and (4) Non-English intense. Classes (1) and (2) would represent the original, non-crossover groups, classes (3) and (4) would represent novel, crossover groups. In a series of matings ex-

tending over more than a year, the following numbers of young have been obtained.

The non-crossover classes have consistently been in excess of the crossover classes. In a total of 83 young, 32 have shown crossover groupings of the two pairs of characters, and 51 have shown non-crossover groupings. This is 38.5 per cent. crossovers, an indicated linkage strength of 23 on a scale of 100.

In a previous paper I have shown that English pattern is allelomorphic with Dutch pattern, or very closely linked with it. If English is linked with dilution, Dutch also must be linked with dilution. Attention should now be turned to the question whether other characters of rabbits belong to this same linkage group, and whether other linkage groups can be detected in rabbits.

W. E. CASTLE

BUSSEY INSTITUTION,
July 24, 1920

THE FAT-SOLUBLE A VITAMINE AND XEROPHTHALMIA[1]

IT is generally admitted by those who have conducted feeding experiments with rats that although the essential dietary factors for growth, including the so-called water-soluble B, are present, the animals will not grow to maturity with out the fat-soluble A. The work of Osborne and Mendel, McCollum and associates, Drummond, Steenbock and associates, and others give abundant evidence of this fact. All investigators are not in accord, however, that a positive lack of the fat-soluble A is the direct cause of the eye condition in the rat which McCollum[2] designated as xerophthalmia, some considering this disease to be primarily infectious.

Bulley[3] has recently taken the most definite stand that this eye condition is not due to a dietary deficiency but primarily to infection, resulting from poor hygienic surroundings and uncleanliness. She based her conclusions on a study of some 500 rats that were fed on definite synthetic rations.

In our laboratory we have had occasion to feed white, and black and white rats on various synthetic rations and in going over our records we have compiled data bearing upon the prevalence of xerophthalmia in relation to the known presence or absence of the fat-soluble A. These results are given in the table below.

Group	Vitamines Absent from Ration	Number of Rats Reported	Positive Cases, Xeroph-thalmia	Per Cent. Positive Cases
A	Fat-soulable *A*	122	120	98.3
B	Water " *B*	103	..	None
C	None (controls)	216	..	"

It is seen that out of 122 rats, Group A, 120 of them or 98.3 per cent. showed sooner or later positive signs of xerophthalmia, and that when the fat-soluble A vitamine was present, with or without the water-soluble B (Groups *B* and *C*), none of the 319 rats showed evidence of this eye ailment. All the rats were fed individually in practically every case. They were kept in metal cages, without any bedding, which were provided with a special removable wire screen floor. The cages, and the food and water cups were always disinfected once or twice a week. The sanitary conditions were, therefore, good. The same assistants handled and fed all the rats so that the attention given them was the same for all and the possibilities of infection from this source was uniform.

It would seem to us that if xerophthalmia was primarily infectious and due to the poor hygienic conditions, that some of the rats in Groups *B* and *C* would certainly have developed it. Further, repeated attempts were made to transmit the disease by using sterile threads of gauze, passing them cautiously over the edge of the lids of the sore eyes, and then carefully inoculating the eyes of the other rats. These tests were negative, as were the controls. This was fairly good evidence that the disease could not be transmitted by this means.

Treatment of advanced cases of sore eyes with a saturated boric acid and also with a

[1] Read before the American Chemical Society, St. Louis, April, 1920.

[2] McCollum, E. V., and Simmonds, N., *Jour. Biol. Chem.*, 1917, XXXII., 29.

[3] Bulley, E. C., *Biochem. Jour.*, 1919, XIII., 103.

silver protein solution failed to relieve the condition. However, when as little as 1 to 2 per cent. of an extract containing the so-called fat-soluble A vitamine was added to the ration, the eyes were speedily cured and the rats increased in weight, indicating that this extract was a specific cure for xerophthalmia.

We therefore agree with McCollum, that xerophthalmia is primarily a dietary deficiency disease, due to a lack of the fat-soluble vitamine. The certainty of the prevalence of the disease depends on the high purity of the essentials that enter into the ration, and on the length of time of feeding, younger animals showing the symptoms much sooner than older ones.

Acknowledgement should be made of the assistance rendered by Miss Marguerite Sturtevant in carrying on this project.

A. D. Emmett

Biological Research Laboratory,
Parke, Davis & Company,
Detroit, Mich.

THE AMERICAN CHEMICAL SOCIETY

The fifty-ninth meeting of the American Chemical Society was held at St. Louis, Mo., Monday, April 12, to Friday, April 16, 1920. The council meeting was held on the 12th, a general meeting on the 13th, both in the morning and in the afternoon, divisional meetings all day Wednesday and on Thursday morning, and excursions Thursday afternoon and Friday. Full details of the meeting and program will be found in the May issue of the *Journal of Industrial and Engineering Chemistry*. The registration was slightly over one thousand, eight hundred and twenty-five enjoying the smoker.

General public addresses were given by Paul W. Brown, editor and publisher of "America at Work," on "The Physical Basis for the Economical Development of the Mississippi Valley," by Chas. H. Herty on "Victory and its Responsibilities." The chief public address was given in the assembly room at the Central High School on "Chemical Warfare" by Colonel Amos A. Fries, director of the Chemical Warfare Service.

The following divisions and sections met: Agricultural and Food, Biological, Industrial Chemists and Chemical Engineers, Organic, Pharmaceutical, Physical and Inorganic, Rubber and Water, Sewage and Sanitation Divisions and the Dye, Leather and Sugar Sections. Further details of their meetings will be found in the May issue of the *Journal of Industrial Chemistry*.

The banquet, held on Thursday evening, April 15th, filled the large banquet hall of the Hotel Statler. Excursions to Laclede Gas Works, Monsanto Chemical Works, East St. Louis plant, and Laclede-Christy Clay Products plant, automobile tour for ladies to parks, Art Museum, Washington University, Missouri Botanical Garden and tea at Bevo Mill and excursion to Standard Oil Refinery, Wood River, Ill., and Illinois Glass Company, Alton, Ill., were enjoyed by all.

A general business meeting was held on Tuesday morning, at which resolutions on the death of Professor Alfred Werner were read by Dr. Chas. H. Herty. Ernest Solvay was unanimously elected an honorary member of the society.

Charles L. Parsons,
Secretary

General Program

Tuesday, April 13

10 A.M.

Address of welcome: Hon. Henry W. Kiel, mayor of St. Louis.

Response: Dr. W. A. Noyes, president, American Chemical Society.

General Addresses

The chemical industry and legislation: Hon. E. P. Costigan, tariff commissioner.

Victory and its responsibilities: Dr. Chas. H. Herty, editor, *Journal Industrial and Engineering Chemistry.*

General Meeting

The prediction of solubility: J. H. Hildebrand.

Selenium oxychloride a neglected inorganic solvent: Victor Lenher. Selenium oxychloride is a liquid whose properties have hitherto been almost wholly neglected. The raw material, selenium, is at present a waste by-product from the electrolytic refining of copper. From the crude material selenium oxychloride can be produced at a very low figure and by the most simple chemical procedure, the actual procedure being to bring in contact selenium dioxide and selenium tetrachloride in carbon tetrachloride solution. Its chemical properties are such that it will probably prove a valuable reagent to the chemist. It is an excellent

solvent for many of the inorganic oxides which are commonly considered to be very refractory in character. Molybdenum trioxide, for example, can be readily separated from the oxide of tungsten. The solution of molybdenum trioxide in selenium oxychloride shows a deep indigo blue color when exposed to bright light, the solution again becoming colorless when placed in the dark. The reagent is an excellent solvent for unsaturated organic substances. The unsaturated hydrocarbons and aromatic hydrocarbons dissolve readily in the solvent while the paraffin hydrocarbons do not. Bakelite, redmanol, the waterproof insoluble casein glue used in airplane construction, pure rubber, vulcanized rubber, asphalt and bitumen, dissolve with ease. The bituminous material can be dissolved from soft coal, leaving a carbonaceous residue. The vegetable oils mix readily with the reagent while with raw linseed oil a rubber-like mass is formed, quite similar to that produced by the action of chloride of sulphur on certain oils. The chemical behavior of the reagent is quite selective. Many inorganic oxides are completely insoluble in it, while others dissolve with ease, making possible many separations. Metallic sodium is not acted on by the reagent, even at 175° C., while with metallic potassium a violent explosion takes place.

Studying plant distribution with hydrogen ion indicators: E. T. WHERRY.

Adsorption of alkaloids: G. H. A. CLOWES.

The chemical resources of the St. Louis district: O. H. PIERCE.

DIVISION OF PHYSICAL AND INORGANIC CHEMISTRY

Wm. D. Harkins, *chairman*

H. N. Holmes, *secretary*

Wednesday and Thursday

A new form of active nitrogen: GERALD L. WENDT and A. C. GRUBB. This form is produced by the corona discharge at 20,000 volts from a fine wire through pure nitrogen at atmospheric pressure. Under most favorable circumstances as much as four per cent. of the nitrogen is transformed into an active form which reacts readily with hydrogen to form ammonia; with oxygen to form oxides; and with lithium, sodium, potassium, magnesium, aluminium, iron and zinc to form nitrides, and with sulfur to form a sulfide. It is probably different from Strutt's nitrogen in that the latter gave neither ammonia nor oxides of nitrogen. Whether it is atomic or an ozone form has not been determined, but on account of its extreme stability the latter is more probable. It forms very slowly in the discharge and persists for hours afterwards, unlike the ozone forms of oxygen and hydrogen. It has a distinct odor resembling formaldehyde.

The ozone form of hydrogen at atmospheric pressures—the formation of ammonia: GERALD L. WENDT, A. C. GRUBB and ROBERT S. LANDAUER. The ozone form of hydrogen has now been prepared by three methods—the action of alpha rays, in the vacuum electrical discharge, and in the corona at atmospheric pressure. Attempts to produce activation by means of Schumann light failed. The ozone hydrogen, or hyzone, is extremely unstable, reverting to the usual inactive form in less than a minute. Figures are given in a detailed study of the formation of ammonia from the hyzone and nitrogen, activated nitrogen and ordinary hydrogen, active nitrogen and hyzone, and mixtures of the two plain gases activated together and reacting in the corona.

New determination of the absolute value of the radium: uranium ratio: S. C. LIND and L. D. ROBERTS.

A general theory of chemical reactivity, calculations of reaction velocities, equilibrium constants and vapor pressures: S. DUSHMAN and IRVING LANGMUIR.

The direct combination of nitrogen and chlorine: W. A. NOYES and GEORGE H. COLEMAN.

The causes and prevention of after-corrosion on the bores of firearms: WILBERT J. HUFF.

The binary system, Akermanite-gehlenite (lime, magnesia, alumina, silica): J. B. FERGUSON and A. F. BUDDINGTON.

The system Fe_2O_3-SO_3-H_2O: E. POSNJAK and H. E. MERWIN. This paper treats the general equilibrium relations in this system from 50° to 200° and comprises the determination of the compositions and properties of the solid phases, as well as the compositions of the solutions in equilibrium with the various solid and vapor phases within the above temperature range.

The ionization of strong electrolytes: JAMES KENDALL.

Changes in the analytical ratios of sugars during refining: A. F. BLAKE. The clerget sucrose value for sugars, as pointed out by Browne at the Cleveland meeting, normally exceeds the polarization by about one third the percentage of invert.

This is true of raw sugars as shown by numerous analyses, but in the products of a refinery, soft sugars and syrup, the value of the ratio SP/I is very low. Analyses of sugars at all intermediary stages of refining are given, in order to determine where the changes takes place. It is concluded that some change takes place during defecation and filtration of low test material and in the handling of the muds and scums, but that by all means the principal cause of the reduction of the value of this ratio is boneblack filtration. The factor is strongly negative for the first material coming off the boneblack, but increases in following portions until in the last portions it is about equal or slightly exceeds material going on. The average of all material going on is much higher than the average coming off. Since boneblack absorbs invert from first material and gives it up to later material it is supposed that by selective action it might absorb more levulose than dextrose. This is proved by tests on invert sugar. A high value of the ratio in refined products indicates inversion during refining. Losses of sucrose figured upon clerget values exceed those figured on polarization.

Heats of vaporization: J. H. Mathews.

Vapor pressure of lithium nitrate-ammonia system: R. O. E. Davis, L. B. Olmstead and F. O. Lundstrum. A number of substances known to be soluble in liquid ammonia were subjected to the action of a stream of dry ammonia gas, and several were found to liquefy and form a solution. This property is well known for ammonium nitrate and ammonium thiocyanate, but has not been heretofore reported for several here recorded. Lithium nitrate is one of these. The vapor pressure of solutions of different concentrations of ammonia, lithium nitrate and water were determined. As the solution is non-corrosive to iron and has a low vapor pressure around zero and over an atmosphere at about thirty-five degrees, it is suggested that it may be utilized for absorption of ammonia from a mixture of gases and the subsequent recovery of the pure ammonia.

Vapor pressure of ammonia-calcium nitrate system: R. O. E. Davis, L. B. Olmstead and F. O. Lundstrum. Calcium nitrate forms a solution with ammonia similar to that formed by lithium nitrate. The vapor pressure is somewhat lower and the ammonia absorbed is not quite so great. This solution is also non-corrosive, but becomes corrosive as carbon dioxide is dissolved in it.

Magnetic properties of dilute solutions of certain metallic oxides in silicate glasses: R. B. Sosman and H. S. Roberts.

Pressure measurements of corrosive gases. The vapor pressure of nitrogen pentoxide: Farrington Daniels and Arthur C. Bright. A new all-glass manometer is described in which a platinized glass diaphragm is arranged to close an electrical indicating circuit. A measured air pressure is thus balanced against the unknown pressure without the aid of optical systems. A convenient method for preparing pure nitrogen pentoxide is given. Determinations of the vapor pressure of nitrogen pentoxide up to an atmosphere are presented. They were obtained by a static method in which corrections were made for the decomposition occurring in the gaseous phase.

The formation of ozone and nitric acid from air in the high frequency corona: F. O. Anderegg.

Electrometric titration of iodides and a practical potentiometer for such work: W. S. Hendrixson. Hydrogen iodide is titrated in 2-normal sulfuric acid with standard permanganate. Sharp end points are obtained and the method seems accurate. Other oxidizing substances and also interfering substances are discussed, and further work is in progress. The potentiometer is a long tube-form rheostat, contact wound with oxidized resistance wire. The beam carrying the slide contact is graduated in millimeters; the instrument has been calibrated, and measurements with it and with a standard potentiometer show practically identical results.

The existence of the nucleus of the meta-hydrogen, the possible presence of meta-hydrogen in hydrogen, and the evidence which indicates that the elements magnesium, silicon, nickel, copper, zinc, and other elements of the atomic numbers from 28 to 80 (mercury), are mixtures. The function of binding and cementing electrons: William D. Harkins.

Welding thermo-couples in the electric arc: James C. McCullough. Base metal thermocouples may be welded in a 15 ampére electric arc providing oxidation of the wires is prevented by directing a stream of illuminating gas against the arc.

The solubility of helium: Hamilton P. Cady, Howard McKee Elsey, Emily V. Berger. The authors found the absorption coefficient of helium to decrease steadily with rising temperature from 0.00938 at 2° to 0.00836 at 30°. The only previous series of measurements was made by Estreicher, who found a minimum at 30°, but Anthropoff showed that Estreicher had omitted a correction which changed his solubility nearly 100

per cent. in some cases, and shifted the minimum to 10°. The authors find no evidence of a minimum at 10° and that Estreicher's results are about 65 per cent. too high and the recalculated ones from 16 to 93 per cent. too high.

Washing in hard water in the presence of colloidal organic hydrosols: I. N. KUGELMASS.

Mineral oil-soap jellies as a foundation for greases: HARRY N. HOLMES.

A photometric method for the study of colloids and some applications to gelatine: S. E. SHEPPARD and FELIX A. ELLIOTT.

Protoplasm and fuller's earth: G. H. A. CLOWES.

On colloidal absorption: the heterogeneous equilibrium between colloids and ions: A. MUTSCHELLER. The subject matter of the paper consists of two parts; the first is experimental and the second part is theoretical. The experimental data given are those of changes caused by the addition of zinc sulphate in increasing concentrations to uniform solutions of gelatine. The experiments performed are on (1) The migration velocities of the ions; (2) the changes of the concentrations of the anions and cations; (3) the velocity of motion of colloidal particles; (4) the surface tension of the solutions; (5) the viscosity of the solutions; (6) the swelling of gelatine. The conclusions from these experiments are compared with the process of ion adsorption by oil drops as studied by Millikan and from the kinetic theory and Einstein equation, adsorption equations of the type generally employed (H. Freundlich & C. G. Schmidt) are derived. Various types of adsorption and the general properties of colloids are reviewed as expressed by the equations derived. (1) Swelling, (2) Hofmeister series, (3) Valency rule, (4) the exponent, (5) the constant and temperature coefficient.

A new form of hydrogen electrode apparatus: FELIX A. ELLIOTT and S. F. ACREE.

Preliminary note on the use of the hydrogen electrode for measuring the separate ionization constants of polyacids and bases; specifically tartaric acid: FELIX A. ELLIOTT and S. F. ACREE.

The use of the hydrogen electrode in measuring the ionization of acid salts: FELIX A. ELLIOTT and S. F. ACREE.

A surface condensation error in certain measurements of vapor pressure by the gas current saturation method: ALAN W. C. MENZIES. The condensation of saturated water vapor on the surface of not too drastically steamed and washed glass-wool, and also asbestos, was investigated under conditions arranged to parallel as closely as possible those that have obtained in the case of many published investigations in which the gas current saturation method was employed. The results indicate that certain annoying irregularities, which, indeed, appear to have led some investigators to abandon their work by this method, become completely explicable if the importance of this neglected source of error is fully realized.

The explanation of the Tammann-Schottky-Partington anomaly: ALAN W. C. MENZIES. Tammann found values, by the gas current saturation method, for the dissociation pressure of salt hydrates from 2 to 5 per cent. higher than Frowein had found by the tensimetric method. Partington by new measurements confirmed Tammann's anomalous results, in harmony with Schottky's finding that the initial readings in tensimetric measurements are higher than the equilibrium readings. Explanations of the anomaly by Tammann, Nernst, Campbell, Partington and Brereton Baker are discussed. Mindful of notorious precedent in the case of Charles II. and the Royal Society of London, the author re-examined the facts experimentally, and found that the real facts exhibit no anomaly.

A differential thermometer: ALAN W. C. MENZIES.

The crystallization of glass: a surface phenomenon. The repair of crystallized glass apparatus: ALBERT F. O. GERMANN.

The separation of the element chlorine into chlorine and meta-chlorine: WILLIAM D. HARKINS and C. E. BROEKER.

A force, apparently due to mass, acting on an electron, and the non-identity of isotopes in spectra and other properties: WILLIAM D. HARKINS and LESTER ARONBERG.

A study of the system ammonia, magnesium, mercury: ALBERT G. LOOMIS.

The influence of pressure on the electrolytic conduction of aqueous solutions: RALPH E. HALL.

A new form of portable standard cell: C. J. ROTTMANN.

Hydrous oxides: II. Hydrous aluminum oxide: HARRY B. WEISER.

Factors determining the degree of reversibility of precipitation of colloidal hydrous oxides: HARRY B. WEISER.

Spontaneous evaporation: Harry B. Weiser and Everett E. Porter.

Negative surface energy: William D. Harkins and Y. C. Cheng.

The formation of ammonia from nitrogen and hydrogen in the corona: William D. Harkins and A. Morton.

The electrical conductivity of dilute aqueous solutions of the alkali hydroxides: Merle Randall and C. C. Scalions.

The partial molal volume of the constituents in solutions of electrolytes: Merle Randall.

A revision of the atomic weight of antimony. Preliminary report: H. H. Willard and R. K. McAlpine.

A separation and volumetric determination of cobalt: H. H. Willard and Dorothy Hall.

A new form of filtering crucible: H. H. Willard.

Notes on the determination of chromium as chromic oxide: Wm. H. Blanchard.

The preparation of colloidal selenium: Victor E. Levine.

A theory of catalytic action: Chas. W. Cuno.

Radiation and chemical reactivity: Eric K. Rideal. The radiation theory of chemical physical action as developed by Trausy Marcelin Price and more recently by Mc. Lewis, Bernouilli and Perrin, in the light of the Rutherford Bohr atomic structure offers a tangible interpretation for the mechanism of chemical and physical change; calculation from radiation data leads to results for the latent heats of evaporation; electrode potentials and heats of reaction of various elements and compounds in close agreement with experimental results. Catalytic action on the radiation theory admits of various interpretations as to the possible modes of mechanism; these are briefly described and answered.

Quantitative measurement of fluorescence: L. J. Desha. The radiation from a mercury arc in quartz tube, separated from most of the visible rays by a glass screen of the "Uviol" type, is allowed to fall upon solutions contained in the cups of the Kober nephelometer. Fluorescent substances emit light which may be compared in the eye piece as in nephelometry. Solutions containing one half to two parts of quinine sulphate per million in normal sulphuric acid yield readily comparable results which are almost if not quite directly proportional to the concentrations. Applications as an analytical procedure are suggested. The work is being continued.

Some applications of sodium peroxide in analytical chemistry: W. M. Sternberg. Some applications of sodium peroxide to analytical processes in particular fusions of lead and zinc ores in iron crucibles have been studied. The decomposition is very rapid and complete in every case. When the usual proportion of sodium peroxide to ore (5 to 8 times the weight of the ore) has been used. If smaller amounts of the peroxide be taken the reaction in case of sulphide ores is rather violent. The results in case of lead ores were uniform but low unless the standard solution has been standardized against a standard ore run by the fusion method. The procedure consisted in fusion one half gram ore in an iron crucible with about 3 to 4 grams of sodium peroxide, dissolving the melt in water, adding 0.7 gram oxalic acid to reduce the lead peroxide. The solution was acidified with sulphuric acid boiled, cooled, lead sulphate filtered and washed with 5 per cent. sulphuric acid. The impure lead sulphate was dissolved in ammonium chloride, or ammonium chloride-sodium acetate mixture, heated to boiling and titrated with ammonium molybdate. In the case of zinc ores the peroxide fusion was dissolved in ammoniacal ammonium chloride solution heated to boiling, filtered and washed with hot ammonium chloride solution, acidified with hydrochloric acid, heated to boiling and titrated with potassium ferrocyanide, after the addition of 50 c.c. of hydrogen sulphide water. Here also good results have been obtained if the solution has been standardized against the standard zinc ore D, or against zinc oxide, both fused and treated in the way described.

Charles L. Parsons,
Secretary

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